

REMARKS

Claims 31-67 are pending in the present application. Claims 31 and 41 have been amended. Support for the amendment to claim 31 can be found in the as-filed specification at page 12, lines 15-21. Additionally, the specification has been amended to add a heading before the brief description of the drawings. Accordingly, Applicants submit that no new matter has been added to the application. Reexamination of the application and reconsideration of the rejections and objections are respectfully requested in view of the above amendments and the following remarks, which follow the order set forth in the Office Action.

Specification

Applicants added the subtitle "BRIEF DESCRIPTION OF THE DRAWINGS" to the application as requested by the Office Action.

Rejections under 35 U.S.C. §112

Claim 41 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants respectfully traverse. Applicants have amended claim 41 to replace $^{+}\text{NR}^2_3\text{X}^{-}$ with $^{-}\text{NR}^2_3\text{X}^{-}$. Applicants submit that amended claim 41 is not indefinite. As such, Applicants respectfully request reconsideration and withdrawal of the instant rejection.

Rejections under 35 U.S.C. § 102

Claims 31, 35-36, 38-43, 46-48, 62, and 67 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,342,521 to Bardot et al ("Bardot"). Applicants respectfully traverse.

Amended claim 31 recites an organic-inorganic hybrid material comprising two phases: a first, mineral phase comprising a structured mesoporous network with open porosity, wherein the structured mesoporous network exhibits an organized structure with a repeating unit; and a second, organic phase comprising an organic polymer, said organic phase not participating in creating the structured mesoporous network of the mineral phase and being essentially not present inside the pores of the structured mesoporous structure of the mineral phase.

As explained in the instant specification, materials referred to as mesoporous are solids which within their structure have pores possessing a size of typically between 2 and 80 nm, which is intermediate between that of micropores and that of macropores. *See*, p. 5, ll. 3-7. Typically, mesoporous materials are amorphous or crystalline metal oxides in which the pores are generally distributed randomly with a very broad distribution in the size of the pores. *See*, p. 5, ll. 8-11. Structured mesoporous or mesostructured materials, such as that recited in claim 31, correspond to structured pore networks that exhibit an organized spatial layout of mesopores. The structured mesoporous materials that are recited in claim 31 are distinct from typical mesoporous materials because they exhibit an organized spatial layout as compared to typical mesoporous materials that exhibit randomly distributed pores with a very broad distribution in the size of the pores. The ability to integrate chemical functionalities into an ordered mesoporous structure such as that present in the organic-inorganic hybrid material of claim 31 is beneficial in a variety of applications (e.g., catalysis, filtration, electrochemistry, etc.). *See*, p. 6, ll. 9-17.

Bardot discloses a reverse osmosis or nanofiltration membrane comprising an inorganic material porous support coated on one face with a first inorganic material mesoporous layer having a mean pore radius below 10 nm and a second active layer placed on the first mesoporous layer, which is made from an organomineral polymer or an organic polymer. *See*, c. 2, ll. 5-15. While Bardot discloses an inorganic material mesoporous layer, it fails to disclose or reasonably suggest a structured mesoporous network with open porosity, wherein the structured mesoporous network exhibits an organized structure with a repeating unit, as recited in amended claim 31. Bardot states that the good mechanical properties and the good pressure resistance of the membrane described therein are due to the presence of the inorganic material support (*See*, c. 2, ll. 60-63), but Bardot does not mention anything about a structured mesoporous layer, such as that recited in claim 31. As the instant specification states, mesoporous materials are typically amorphous or crystalline metal oxides in which the pores are generally distributed randomly with a very broad distribution in the size of the pores. Thus, it is likely that the mesoporous layer of Bardot is a typical mesoporous layer wherein the pores are distributed randomly. Given Bardot's silence regarding the structure of the mesoporous layer and the understanding of one of ordinary skill in the art with regard to mesoporous materials, Applicants submit that the invention of claim 31 is neither anticipated by nor rendered obvious by Bardot. As such, Applicants respectfully request reconsideration and withdrawal of the instant rejection.

Rejections under 35 U.S.C. § 102/103

Claims 31-34, 37, 42-46, 49, 61, and 67 were rejected under 35 U.S.C. 102(b) as being anticipated by or obvious in view of Brinker et al., U.S. Patent No. 6,270,846 ("Brinker"). Applicants respectfully traverse.

As indicated above, amended claim 31 recites an organic-inorganic hybrid material comprising an organic phase comprising an organic polymer, said organic phase not participating in creating the structured mesoporous network of the mineral phase.

Brinker discloses an evaporation-induced self-assembly method to prepare a high-porosity, surfactant and microemulsion templated thin film by mixing a precursor sol, a solvent, water, a surfactant, and a hydrophobic polymer. *See*, c. 2, ll. 20-23.

In Brinker, in the liquid phase, a precursor sol, a solvent, and water are mixed with a hydrophobic polymer, soluble in the solvent, and with a surfactant, wherein the initial surfactant concentration is less than the critical micelle concentration. *See*, c. 2, ll. 51-55. Because the surfactant concentration is less than the critical micelle concentration, subsequent solvent evaporation induces micellization, incorporation of hydrophobic polymers into the hydrophobic micellar interiors, and further assembly into hybrid materials. *See*, c. 2, ll. 55-60. Evaporation of the solvent promotes stabilization of the polymer in microemulsions along with additional self-assembly of silica surfactant mesophases so that a thin film can be formed on a substrate. *See*, c. 2, ll. 60-63. The hydrophobic polymer aids in the self-assembly process, serving as a swelling agent to form a high-porosity structure. *See*, c. 2, ll. 63-65. Subsequent calcination of the thin film can result in a hierarchical mesostructure composed of pores templated by both microemulsions and surfactant liquid crystalline assemblies with the thin films having a porosity of greater than approximately 50%. *See*, c. 2, l. 65-c.3, l. 3. When the films are calcinated, the surfactant and the polymer are removed from the film. *See*, c. 3, ll. 51-52. More specifically, the surfactant molecules and the polymer are removed by a low temperature pyrolysis procedure. *See*, c. 3, ll. 58-59. In exemplary preparations in Brinker, the as-coated films were heated to approximately 400 to 450°C to remove surfactant and polypropylene oxide templates. *See*, c. 4, ll. 26-28 and c. 5, ll. 3-5. Thus, in Brinker, the final material film does not comprise an organic phase comprising an organic polymer, as recited in amended claim 31, because the polymer (polypropylene oxide) is removed from the film in the calcination step. Additionally, Brinker discloses that the hydrophobic polymer aids in the self-assembly process by serving as a

swelling agent to form a high-porosity structure. Essentially, the hydrophobic polymer is acting as a pore-forming agent. Thus, Brinker does not disclose or render obvious an organic phase that does not participate in creating the structured mesoporous network of the mineral phase, as required by claim 31. Rather, the organic phase serves as swelling agent to form the high-porosity structure. Based on the foregoing, Applicants submit that claim 31 is not anticipated by or rendered obvious by Brinker. As such, Applicants respectfully request reconsideration and withdrawal of the instant rejection.

Rejections under 35 U.S.C. § 103

Claim 66 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bardot, in view of U.S. Patent No. 6,465,052 to Wu ("Wu"). Applicants respectfully traverse. Applicants submit that Wu does not provide any disclosure or suggestion that overcomes the deficiency of Bardot, which is described in detail above, because Wu fails to disclose a structured mesoporous network exhibiting an organized structure with a repeating unit, as required by amended claim 31, from which claim 66 ultimately depends. Accordingly, claim 66 is not obvious in view of the combination of Bardot and Wu. As such, Applicants respectfully request reconsideration and withdrawal of the instant rejection.

For the foregoing reasons, claims 31-67 are considered allowable. A Notice to this effect is respectfully requested. If any questions remain, the Examiner is invited to contact the undersigned at the number given below.

The Director is hereby authorized to charge any appropriate fees that may be required by this paper, and to credit any overpayment, to Deposit Account No. 23-1925.

Respectfully submitted,

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